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Canadian Science Advisory Secretariat
Science Response 2014/034

Maritimes Region

SCALLOP FISHERY AREA/TIME CLOSURE TO REDUCE YELLOWTAIL FLOUNDER BY-CATCH ON GEORGES BANK IN 2014

Context

Since 2007 Fisheries and Oceans Canada (DFO) has implemented area/time closures during the month of June for the offshore scallop fishery to reduce Yellowtail Flounder by-catch. An area of Georges Bank, approximately 87.5 square nautical miles, was closed during June 2013. The closure area was determined following a review of Yellowtail Flounder by-catch distribution and relative abundance during the month of June, which coincides with the latter part of the yellowtail spawning season on eastern Georges Bank (O'Brien et al. 1993) and the opening of the Georges Bank groundfish fishery. The distribution was based on observed groundfish trips from the otter-trawl fleet (2005 to 2012). Temporal trends in the distribution of the offshore scallop fishery between 1997 and 2012 were also considered. The methodology for the development of scallop fishery time/area closures to reduce yellowtail by-catch followed that initially described by DFO (2007).

This report provides an update to the 2013 report (DFO 2013) on the scallop fishery area/time closure to reduce Yellowtail Flounder by-catch on Georges Bank. It includes an analysis of the spatial distribution of yellowtail by-catch during June based upon observed trips from the groundfish otter-trawl fishery. By-catch data from observed June trips of the offshore scallop fishery were not examined due to a paucity of data and much greater observer coverage from the groundfish otter-trawl fishery.

This Science Response Report results from the Science Response Process of May 5, 2014, Update for Scallop Fishery Area/Time Closure to Reduce Yellowtail Flounder By-catch on Georges Bank in 2014.

Analysis and Response

The 2013 second quarter Canadian offshore scallop catches on Georges Bank correspond to approximately 42% (2148 mt of meats) of the Total Allowable Catch (TAC) for the year, which is similar to the most recent average percentage for the second quarter (40% since 2009). At the start of the 2013 fishery, there were three industry-managed juvenile scallop closure areas in place (outlined in red in figures 1 and 2). The center "growout box" (dashed box) was opened to fishing on May 25, 2013. The most western "seed" box and the "growout" box were closed on January 1, 2012. The eastern "a/b line" box was closed on November 1, 2012. A new industry closure box (outlined in blue) was closed on January 1, 2014. The cells selected for closure in June of 2013 (see asterisks in figures 1 and 2) landed a total of 8 mt of scallop meats in the second quarter prior to the closure, which began on June 1, 2013.

Information from observed groundfish otter-trawl fishery trips for 5Zjm conducted during June was used to identify areas of greater yellowtail by-catch rates. While observer coverage of the fishery in 5Zjm extends back to earlier years, the time series for rates used to examine the spatial distribution of Yellowtail Flounder by-catch begins in 2005 when coverage increased significantly. Noteworthy is that the most recent assessment of the Georges Bank (5Zhjmn) Yellowtail Flounder stock indicated that current adjusted adult biomass is at a very low level

(826 mt; Legault et al. 2013). Consequently, current by-catch rates may be lower compared to earlier years.

In 2013, at-sea observer coverage of the groundfish otter-trawl fleet was approximately 66% with a total of 3110 sets monitored compared to 2734 sets in 2012. Observed sets occurred in all months fished when the bank was open to commercial groundfish fleets (there is no Canadian groundfish fishery in 5Zjm from mid-February to the end of May). The majority of observed sets (98%) were from 5Zj, and Yellowtail Flounder were caught during all months in 5Zj observed sets. No yellowtail were caught in 94% ($n = 2922$) of the 3110 sets observed in 2013, compared to 82% in 2012, 84% in 2011, 80% in 2010, 79% in 2009, 69% in 2008, 76% in 2007, and 78% in 2006.

As in previous years, initially the yellowtail by-catch rate of each fishing set (2005 to 2013) was converted to catch per hour (kg/hr), and then the by-catch rate per aggregated cell¹ was determined using two methods: 1) the average rate for all fishing sets for all years within a cell (method from previous years), and 2) the "standardised" average rate for all sets within a cell. By-catch rates were standardised by dividing the by-catch rate for a set by the mean by-catch rate for the whole area, i.e., the Canadian portion of 5Zjm, for each year. These standardised estimates then were averaged in each aggregated cell over the 2005 to 2013 time period. This method has the effect of diluting the influence of very large individual tows and reducing between-year variability, both especially important as the stock's productivity declines.

The spatial distribution of observed otter-trawl sets from 2005 to 2013 during the month of June (when yellowtail by-catch rates were generally highest annually) covered almost all of the Canadian portion of 5Zj and the western portion of Canadian 5Zm (Figure 1). Areas with by-catch rates ≥ 3.5 standardised kg/hr, a proxy for high density areas², were ranked 1 to 9 in order of decreasing rate on the Canadian portion of Georges Bank (Figure 1a). Five of the seven cells ranked in the 2013 analysis remained as ranked standardised cells in this analysis although not in the same sequence. The four highest ranked cells did not change in rank between this analysis and 2013, and they were part of the 2013 scallop fishery yellowtail closure. Two cells from the 2013 closure were unranked in this analysis, and one 2013 closure cell changed from a ranking of 6 to 7.

Overall, using either method, the distribution of by-catch rates remained similar to the previous year's analysis (Figure 1a and b). The greatest by-catch rates occurred predominately in two areas, in the vicinity of what is known as the 'Yellowtail Hole' in 5Zm (including cells 2, 3, 4, 5, and 7) and an area in 5Zj near cells ranked 1, 6, and 8 (Figure 1a).

There is little overlap between the distribution of high second quarter (Q2) scallop catch and the ranked cells from this year's otter-trawl fishery analysis (Figure 2a). Ranked yellowtail by-catch cells from this analysis had either no 2013 Q2 scallop catch or very low catch, i.e., less than 5 mt per cell, except for the standardised cell ranked 6 (a cell's Q2 catch may be influenced by the June 2013 closures). Four ranked standardised cells were not fished at all by the scallop fleet in Q2 of 2013 (Figure 2a). If scallop fishing in Q2 of 2014 is confined primarily to 5Zj, as it was in 2013, the June closure of standardised cells ranked 2 to 5 and 7 would have almost no effect on scallop catches (note: there was a verbal agreement with the scallop fishing industry to not

¹ Cells are 5 minutes longitude by 3.33 minutes latitude, representing approximately 12.5 nm² or 43 km² per cell.

² Prior to 2007, a threshold rate of 5 kg/hr (approximately equivalent to 3.5 standardised kg/hr) was used. Due to the increasing estimates of adult biomass between 2005 and 2009, threshold values of 10 kg/hr were used since 2007 (DFO 2010). However, in light of the most recent stock assessment results, which indicate some of the lowest biomass estimates on record (see Legault et al. 2013), using the previous threshold value of 5 kg/hr is considered to be more appropriate.

fish in 5Zm during June 2013). Closures of standardised cells ranked 1 and 8 in 5Zj also would have a low impact on the scallop fishery. Closure of cell ranked 6 with a by-catch rate of 4.3 standardised kg/hr may have some effect on the fishery (2013 Q2 scallop catch of 14.6 mt).

The 2013 second quarter scallop landings in the nine ranked standardised cells were 22.5 mt (only 1% of the Q2 scallop landings of 2148 mt). A closure based on these cells would have a relatively low impact on the offshore scallop fishery in 2014 if the second quarter scallop fishing distribution in 2014 is similar to that of the second quarter in 2013 (Figure 2a). The 2013 second quarter fishing distribution is very similar to the long-term (1997 to 2013) average scallop fishing distribution (compare figures 2a and 2b).

Yellowtail by-catch rates in the offshore scallop fishery are traditionally at seasonal highs during the second quarter (DFO 2013), which coincides with Yellowtail Flounder spawning on eastern Georges Bank (O'Brien et al. 1993). However, average monthly by-catch rates from observed scallop trips are much less indicative of Yellowtail Flounder distribution than otter-trawl observed trips (DFO 2013). The target observer coverage in the offshore scallop fleet on eastern Georges Bank has been two trips per month (DFO 2013), which is not proportional to the monthly trends in scallop fishing effort. This restricts the resolution and spatial coverage provided by the offshore scallop fishery data and, therefore, its interpretation.

Conclusions

Yellowtail Flounder by-catch rates from observed groundfish otter-trawl fishery trips for the last nine years (2005 to 2013) can be used as a proxy to determine areas of higher yellowtail densities in the current productivity regime. A time/area closure for June 2014 should be based upon these distributions. Standardised by-catch rates (method 2) should be used in analyses because they dilute the influence of very large individual tows and reduce between-year variability, both especially important as the stock's productivity declines.

The June 2013 area/time closure closed three cells in 5Zj (also closed from 2009 to 2012), which caused scallop fishing activities to be displaced. Four cells located in 5Zm in the vicinity of the 'Yellowtail Hole' were closed with little apparent impact to scallop catches.

Using the by-catch rates from the June groundfish otter-trawl fishery as an established proxy for Yellowtail Flounder density and distribution, nine cells with an average by-catch rate greater than 3.5 standardised kg/hr could qualify for an area/time closure in 2014. The four highest ranked cells were identical in rank and location to those reported in 2013. The closure of cells (ranked 2, 3, 4, 5, and 7) located in the vicinity of the 'Yellowtail Hole' would likely have a minimal impact on scallop fishing activities provided that the 2014 second quarter scallop fishing distribution is similar to that of the second quarter in 2013. For 5Zj, much of the scallop fishing activity on eastern Georges Bank in 2013 took place northwest of where cells ranked 1, 6, and 8 are located.

To determine if the 30-day closure in June is the most appropriate time to implement a seasonal closure for Georges Bank Yellowtail Flounder, it would be necessary to have information on spatial distribution, abundance, and by-catch rates during the entire spawning season, which includes April and May in addition to June. Currently there is no source of information available for April and May other than the observer coverage of the offshore scallop fishery which, given the targeted nature of the fishing patterns, is not useful for determining the spatial distribution of yellowtail. Thus, our ability to address yellowtail distribution during the spawning season is not possible. The collection of yellowtail sex and maturity data during observed trips from both the offshore scallop and groundfish fisheries would help to verify peak spawning times and examine whether catchability may change with spawning condition.

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Sources of Information

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Appendix

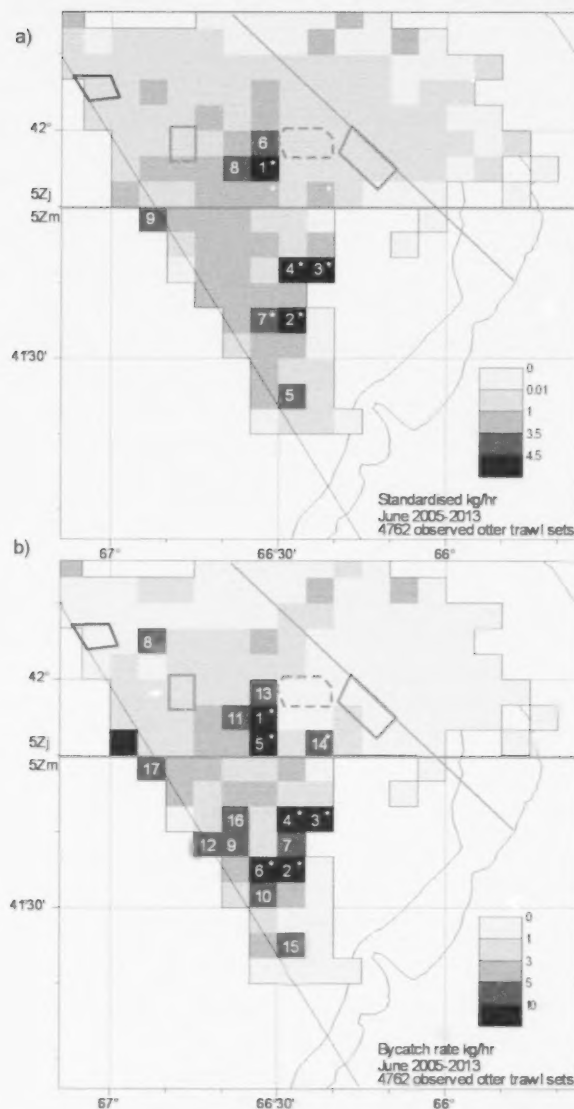


Figure 1. Distribution of average aggregated Yellowtail Flounder by-catch rates (kg/hr) for the month of June, 2005 to 2013, from observed otter-trawl sets on eastern Georges Bank ($n=4762$). Cells that were part of the 2013 scallop fishery yellowtail closure are indicated by an asterisk (*). The 2 current industry-initiated scallop-fishery closure areas and the "growout box" (opened May 25, 2013) are outlined in solid and dashed red lines, respectively. The closure area outlined in blue was initiated on January 1, 2014. The horizontal red line demarcates NAFO divisions 52j and 52m. The diagonal red line demarcates the Georges Bank scallop management areas 'a' and 'b'.

a) The by-catch rate has been standardised by dividing June fishing set by-catch rates by the mean by-catch rate for the whole area, i.e. 52jm, for each year, and then averaged in each aggregated cell from 2005 to 2013. Cells representing values greater than 3.5 standardised kg/hr were ranked (highest to lowest, Canadian side only).

b) The average by-catch rate of June fishing sets in each aggregated cell from 2005 to 2013. Cells representing values greater than 5 kg/hr were ranked (highest to lowest, Canadian side only).

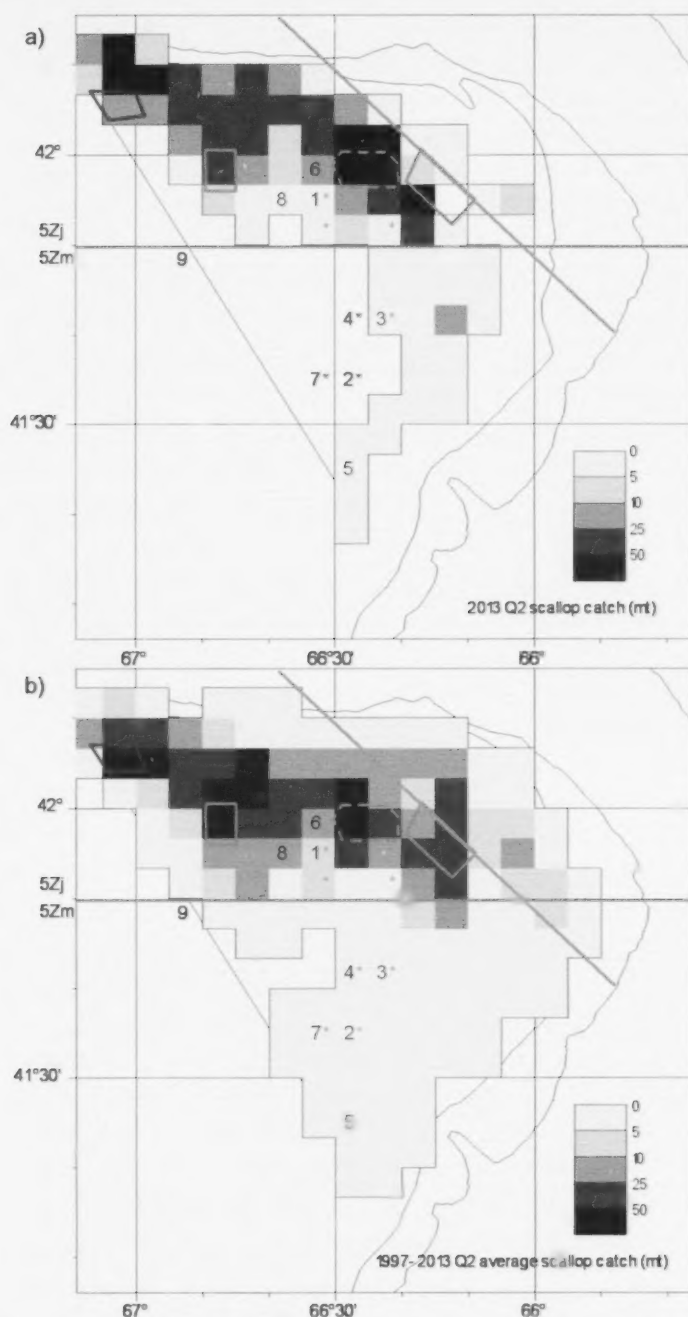


Figure 2. Distribution of offshore scallop catches (mt of meats) by the Canadian scallop fishery on eastern Georges Bank a) during the second quarter of 2013, b) from 1997 to 2013. Cells that were part of the 2013 scallop fishery yellowtail closure are indicated by an asterisk (*). The 3 industry-initiated scallop fishery closure areas that were in effect during this quarter are outlined in red (the "growout box", which opened May 25, 2013, is indicated by the dashed red line). The closure area outlined in blue was initiated on January 1, 2014. The horizontal red line demarcates NAFO divisions 5Zj and 5Zm. The diagonal red line demarcates the Georges Bank scallop management areas 'a' and 'b'. Numbers 1 to 9 represent the ranked standardised yellowtail by-catch cells from Figure 1a.

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ISSN 1919-3769

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Correct Citation for this Publication:

DFO. 2014. Scallop Fishery Area/Time Closure to Reduce Yellowtail Flounder By-catch on Georges Bank in 2014. DFO Can. Sci. Advis. Sec. Sci. Resp. 2014/034.

Aussi disponible en français:

MPO. 2014. Fermetures spatiotemporelles de la pêche au pétoncle destinées à réduire les prises accessoires de limandes à queue jaune sur le banc Georges en 2014. Secr. can. de consult. sci. du MPO, Rép. des Sci. 2014/034.